

Summary of Energy Efficiency Projects

As part of the USAID-funded, EE/DSM/RE Program, AEAI has implemented 19 pilot projects with the objective of demonstrating the feasibility and economic potential of various energy efficiency and renewable energy technologies for Armenia and expanding the market and increasing the quality of energy services in Armenia. An immediate result of these efforts will be the replication of similar projects with local resources, a more broad-based range of services provided by ESCOs and a better outreach to clients.

Demonstration projects have been implemented in municipal, residential, industrial/commercial and agricultural sectors and can be mainly categorized into three types: heating/weatherization, renewable energy and electric projects. While the major part is financed by the USAID, the local stakeholders – project beneficiaries – share from 15 to 40% of the project cost.

Different measures with total number of 35 were used in the pilots and included gas heating from locally installed high-efficiency boilers, HVAC (combined heating, ventilation & air-conditioning), weatherization, metering and controls, efficient lighting, upgrading of automation systems in electric sub-stations, biogas production, solar water heating and wood drying systems. Some of these energy technologies such as HVAC and wood drying chambers are new for Armenia. Although new technologies might seem costly, initial installation expenses will be paid back from savings as the systems operate. The simple payback period of most pilot projects ranges from 0.5 to 6 years depending on the size and the nature of technologies.

The list of our heating/weatherization projects includes municipal buildings such as the Armenian Public Services Regulatory Commission Office, Energy Institute, Pushkin School #8, IT Regional Academy building, medical institutions - Nork Marash Center buildings, Polyclinic #8 in Yerevan, Polyclinic #1 and Integrated Services Center in Vanadzor as well as several residential buildings in Yerevan and Gyumri. In the Erebuni Branch of Electric Network of Armenia, Armenia Medical Center and ArmRusGasProm, USAID has sponsored the technical upgrading of electric substations including the automation systems in order to reduce the stand-by losses from transformers. A totally new technology for Armenia is the wood drying chambers operating on wood wastes which are currently installed on two wood processing plants of Yerevan. To encourage the use of renewables, a 25 m³ biogas digester was built on AgroService dairy farm located in the outskirts of Yerevan. Solar hot water collectors installed on the roof of Nork Marash Medical Center provide hot water for various domestic needs.

a) **RESIDENTIAL SECTOR PROJECTS**

1. **Energy Efficiency and Heating System Rehabilitation Project in the Residential Building #155 in Gyumri.**

The most feasible heating alternative for this earthquake zone residential project was to replace the old electric and wooden stoves used by the population with the gas heaters. Windows in apartments were weatherized to reduce air infiltration. The project yields natural gas reduction equal to 8072 million BTU and 1055 MWh of electricity generation reduction.

2. Heating Project at 33 Sayat-Nova Street, Yerevan

The innovative approach implementing in this project was to promote commercialization of heat services provided to consumers. An ESCO established commercial relations with the residents of Sayat-Nova 33 building as a heat service provider where heat is a commodity measurable and manageable by consumers.

The company converted the Thermal Central Substation into a boiler house, renovated the entire heat distribution network, and constructed the gas line. Old and worn-out pipelines and radiators in the apartments were replaced. Capacity of the boiler house is sufficient to provide heat to nearby buildings as well.

3. Support to Condominiums for Overcoming Barriers to Independent Operation of Boiler Houses and Heat Supply

The objective of the project was to support condominiums in the initial phase of the implementation of Urban Heating Strategy in overcoming institutional and organizational barriers for organizing efficient and affordable heating. The project was implemented by the National Association of Condominium Owners, by the condominiums “Argishti” (Yerevan) and “Progress” (Gyumri). Heat consumption in residential buildings was measured and monitored using heat cost allocators installed in the apartments and main point. Condominiums were provided with institutional training in the organization of residential heat supply.

4. Heating Project in Northern Ray Condominium

AEAI is currently installing combined heating, ventilation and air conditioning system in the Yerevan condominium “Northern Ray” that consists of 10 private houses. Buildings are also equipped with new energy efficient windows that will decrease energy losses.

The condominium will enter into a separate contract with the ESCO for further maintenance and operation of the HVAC system. The ESCO will serve the agent of the condominium in public utility companies. Natural gas reduction due to the project is calculated to 23004 million BTU and electricity generation reduction 2013 MWh.

5. Heating Project at Aram Khachatryan 29 Street, Yerevan

In this project, AEAi demonstrates the operation of small-capacity boiler houses for residents. The project is implemented in one entrance of a residential building located at 29 Aram Khachatryan Street in Yerevan. Measures include the installation of the boiler on the roof of the building, rehabilitation of the international heating system, weatherization of windows and the entrance door, installation of regulating valves, and construction of the gas line.

b) MUNICIPAL-GOVERNMENT PROJECTS

1. Energy Efficient Office Building for the Public Utilities Regulatory Commission (NMRC) of Armenia

In December 2003, AEAI together with the Public Utilities Regulatory Commission (PURC) organized the official opening of the PURC new building. The reconstruction project was implemented with funding from the US Agency for International Development, which dedicated funds for the energy efficiency component of the project, and the World Bank that funding the remaining part of the reconstruction work.

The building is equipped with modern energy efficiency equipment which ensures an excellent comfort level in the building while helping to save energy. Under this project, AEAI has built the heating, ventilation and air conditioning system in the building, energy efficient lighting system, as well as installed energy efficient windows and doors. The potential for energy saving due to this project is calculated to nearly 9000 USD. Natural gas reduction due to the project is calculated to 4957 million BTU and electricity generation reduction will be equal to 612 MWh.

2. Energy Institute Heat Supply Project, Yerevan

The objective was to minimize electricity consumption by switching to natural gas for heating purposes. Activities included construction of the local boiler house and the gas line as well as rehabilitation of internal and external distribution systems. The boiler house is equipped with two high efficiency gas fired boilers 90 kW each. To reduce energy losses, the radiators are furnished with the thermo-regulating valves.

Windows are weatherized which will decrease energy losses at least by 20 %. The total annual energy savings for this project are estimated to be nearly 8600 USD, of which 2000 USD are due to weatherization. Natural gas reduction due to the project is calculated to 2033 million BTU and electricity generation reduction will be equal to 353 MWh.

3. Boiler House Construction and Weatherization of Polyclinic # 1 and Integrated Social Services Center, Vanadzor

The rehabilitation of Vanadzor Polyclinic #1 heating system and the weatherization of the Integrated Social Services Center is an earthquake zone project. Energy efficiency measures implemented in Polyclinic #1 included installation of the heating system operating on natural gas as well as weatherization. Each radiator is equipped with a thermo-regulating valve to regulate energy consumption. Energy savings potential in the Polyclinic is estimated to be about 11300 USD per year. AEAI has completed weatherization of the Integrated Social Services Center. The annual energy savings potential in the Center is calculated to nearly 3062 USD. Natural gas reduction due to the project is calculated to 4774 million BTU and electricity generation reduction will be equal to 552 MWh.

4. Pushkin School # 8 Heating System Rehabilitation

It has been a decade that Pushkin School #8 has had no centralized heating. For heating purposes, the school used electric heaters which proved to be expensive and inefficient. The average temperature in the building was 5-6 ° C. The corridors, the gym and the concert hall were not heated at all. The heating project in the school was completed in December 2003, and last heating season students of the school studied in warm and comfortable classrooms.

Heat was supplied from the locally constructed boiler house equipped with gas-fired boilers. The internal and external heating systems were totally rehabilitated and gas line was constructed. The proposed measures provide more comfortable and safe heating to school versus the old electric one. The annual energy savings in the project will vary from 500 to 2500 USD per heating season depending on the comfort level.

5. Boiler House Construction with Solar Heating System for Nork Marash Medical Center

Nork Marash Center is merited as one of the most advanced and largest medical institutions in Armenia. It consists of six building blocks. Over the last 10 years, the hospital relied on electricity for heating purposes. Thus, the expenses of the Medical Center for heating and hot water in 2002-2003 were 522 000 kWh.

AEAI implemented two energy efficiency projects in Nork Marash Medical Center. During the first project which, AEAi rehabilitated the internal heating system of the main building, installed gas boiler, solar water heating systems (44m² of solar collectors), TRVs and performed weatherization replacing old windows with new metal plastic ones. After the implementation of the project, the heating expenses will be reduced by three-four times.

The capacity of the boiler house was sufficient to provide heating to other buildings of the center. Therefore, in the second cycle of projects, AEAi started the energy efficiency project in the second building of the Center. AEAi rehabilitated the internal heating system of the building, constructed the gas line and weatherized the windows.

6. Armenia Medical Center Project

The project was finished in the beginning of November. The project technically upgraded four electric distribution substations of the medical center to reduce stand-by losses of transformers at idle running. The automation system was renovated to ensure constant electricity supply of the center. Natural gas reduction due to the project is calculated to 3754 million BTU and electricity generation reduction will be equal to 353 MWh.

7. Energy Efficiency Project in the Regional IT Academy

In this project, AEAi upgrades the boiler house of the IT Regional Academy building in Yerevan. Upon the reconstruction of the boiler house, new boilers are to be installed and the gas line to be constructed and connected to the boiler house. The building will have a heat supply in the 2004-2005 heating season. Annual energy savings due to the project are nearly 8000 USD, the simple payback period of the project is 4.9 years.

8. Energy Efficiency Project in Polyclinic # 8, Yerevan

As other municipal institutions, the Polyclinic used electricity for heating. While most of the premises were not properly heated, lack of weatherization led to huge heat losses. AEAi through its sub-contractor is building a new heating system for the Polyclinic that includes installation of the gas-fired boiler, renovation of the internal heating system, installation of regulating valves on

radiators, and weatherization of windows. The new system will provide higher comfort level in the building followed by a significant reduction of energy expenditures as compared to old electric heating.

C) COMMERCIAL/INDUSTRIAL PROJECTS

1. Installation of Wood Drying Complex

The wood drying complex installed at two wood processing plants works on wood wastes obtained from wood processing. The projects imported Russian equipment for wood processing, hermetic double glazed packet manufacturing, and production of energy efficient windows with wooden frame.

The wood drying chambers replaced the old self-made equipment operated on electricity. Lack of control over the process resulted in high percentage of damaged dried wood. Another negative aspect of this method was fire risk. The new wood drying chambers have the automatic control system and are more energy efficient. After installation, the annual savings will make nearly 4900 USD, with the simple payback period of the project being 3.8 years.

3. Electrical Network of Armenia, Erebuni Branch of Yerevan

The project was implemented in twenty electric substations of Erebuni branch each of which is equipped with two transformers. The idea of this project was to redistribute the loads falling on two transformers of each substation to a single transformer. The other transformer is shut down and will be re-operated again as the demand for electricity increases. Measures help to increase the efficiency of transformers' operation. The annual energy savings resulting from the project are estimated to be around 20,000 USD at the current electricity tariffs. Natural gas reduction due to the project is calculated to 7453 million BTU and electricity generation reduction will be equal to 701 MWh.

4. Transformer Sub-Stations Redesign in ArmRusGasProm

The main objective of this project is to substitute the capacity of installed transformers at ArmRusGasProm electric substations aimed at reducing the stand-by losses from transformers at idle running and installing new automatic equipment. Due to energy efficiency measures, the losses from the system will be reduced twice. Use of upgraded electric equipment will increase the maintenance safety and reliability of substations eliminating the manual switch off of transformers.

D) AGRICULTURAL SECTOR PROJECTS

1. Installation of 25 m³ at Agroservice farm

AEAI has sponsored the installation of 25 m³ biogas system operating on animal wastes. The biogas digester produces 50 m³ (capacity of 14 kW) of methane per day to be used for providing hot water and heating of facilities. The use of methane at Agro Service can yield the annual savings of natural gas equivalent to 828 USD. Natural gas reduction due to the project is calculated to 279 million BTU.